

(12) UK Patent Application (19) GB (11) 2 042 802 A

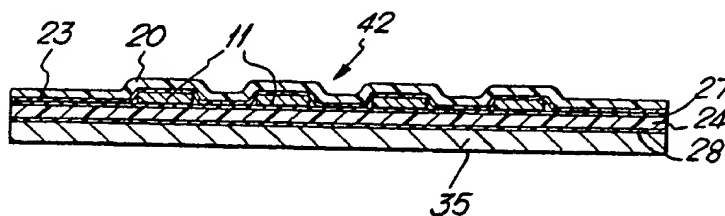
- (21) Application No 7905139  
(22) Date of filing 14 Feb 1979  
(43) Application published  
24 Sep 1980  
(51) INT CL<sup>3</sup>  
H01L 21/56  
(52) Domestic classification  
H1K 1EB 5A1 5A4 5A5  
5F1 5F3 PE  
(56) Documents cited  
GB 1383574  
GB 1327971  
GB 1297000  
GB 1264568  
GB 1197369  
GB 1167572  
(58) Field of search  
B8C  
H1K  
(71) Applicants  
Ferranti Limited,  
Hollinwood, Lancashire  
(72) Inventor  
Kenneth Watkin  
(74) Agent  
A. R. Cooper

(54) Encapsulation of semiconductor devices

(57) At least one semiconductor device 11 is encapsulated by being retained between two compliant plastics sheets 20 and 24, contiguous parts of the sheets being secured together in a sealing relationship, the plastics sheets conforming closely to the shape of, and being in sealing

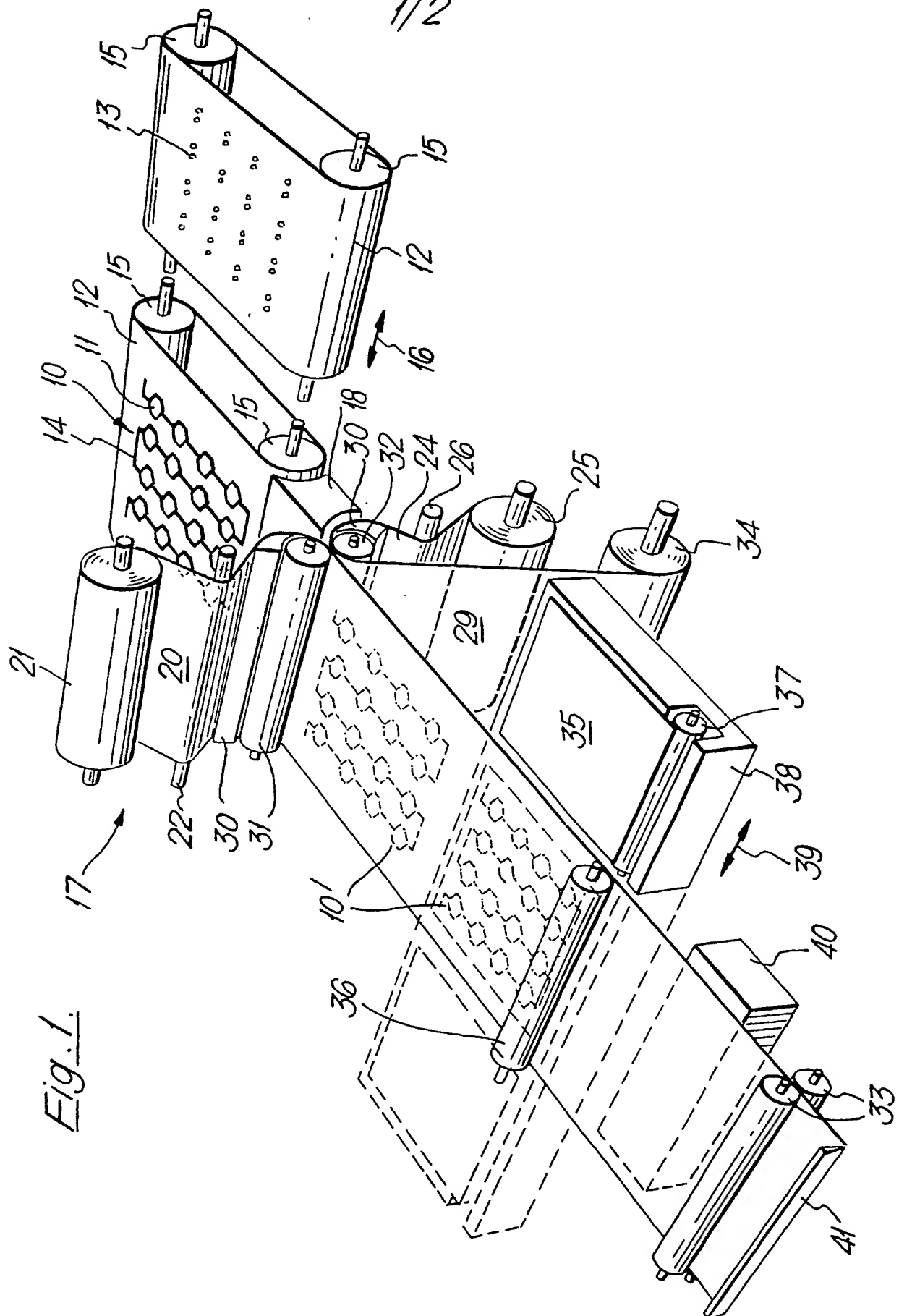
relationship with, at least, the portions of associated interconnection members, with which the sheets are contiguous. The sheets may be subjected to heat and/or to pressure to encapsulate the device, and may be compliant by being flexible, and/or by including an adhesive 23 to conform at least to the shape of the portions of the interconnection members with which the adhesive is contiguous.

*Fig. 2.*

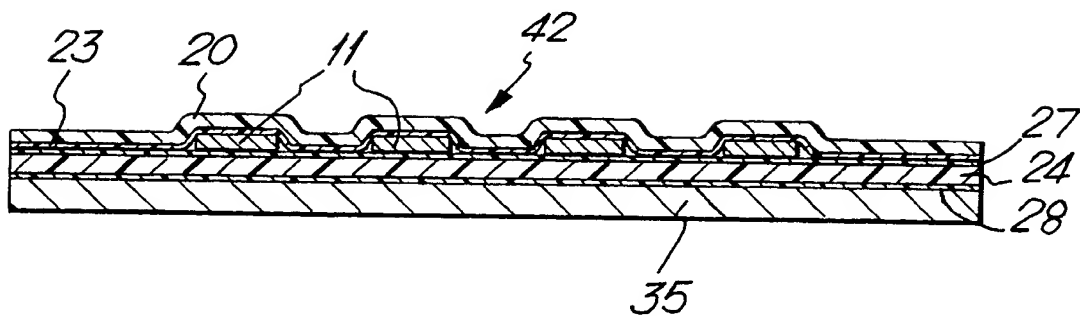


The drawings originally filed were informal and the print here reproduced is taken from a later filed formal copy.

GB 2 042 802 A



2/2

*Fig. 2.*

## SPECIFICATION

## Encapsulation of semiconductor devices

This invention relates to the encapsulation of semiconductor devices.

- 5 It is an object of the present invention to provide a novel and advantageous method of encapsulating semiconductor devices.

- 10 It is another object of the present invention to provide a novel and advantageous construction for a package including at least one encapsulated semiconductor device.

- 15 According to the present invention a method of encapsulating at least one semiconductor device, and parts of associated interconnection members connected to the semiconductor device, in a package, comprises providing two compliant plastics sheets, feeding the semiconductor device between opposing major surfaces of the plastics sheets, and securing together in a sealing relationship at least contiguous parts of the opposing major surfaces of the plastics sheets, to encapsulate the semiconductor device, the plastics sheets being compliant with at least the shape of the portions of the interconnection members with which the sheets are contiguous, the plastics sheets being in sealing engagement with the contiguous portions of the interconnection members.

- 20 Desirably the device is at least substantially hermetically sealed within the package. A commercially acceptable lifetime for a semiconductor device, which is either hermetically sealed, or not hermetically sealed, can be provided with the method of packaging referred to above.

- 35 At least some of the parts of the two plastics sheets contiguous with the semiconductor device and/or with the associated interconnection members may be secured thereto.

- 40 Usually, parts of the associated interconnection members are exposed, and comprise terminals for the package. The exposed parts of the interconnection members may be provided in any convenient way, including initially encapsulating the whole of the interconnection members and punching through the portions of at least one of the plastics sheets on terminal portions of the interconnection members, in order to contact the thus exposed terminal portions.

- 50 When the package includes more than one encapsulated semiconductor device there may be associated interconnection members extending between the devices, which interconnection members are wholly encapsulated within the package.

- 55 The device may be encapsulated by the application of heat and/or of pressure to the plastics sheets. Required pressure on the two plastics sheets may be provided at least partially by laminating rollers; or by encapsulating the device in an atmosphere of substantially zero pressure between the two plastics sheets, instead of, or in addition to, the pressure applied by laminating rollers.

If the device is not encapsulated in an

- 65 atmosphere of substantially zero pressure between the two plastics sheets, the device may be encapsulated in an inert atmosphere.

- 70 The device may, or may not be coated with a potting compound, before being fed between the two plastics sheets. If the device is not coated with a potting compound, the material or materials of the plastics sheets, and any adhesive between the sheets, in contact with the semiconductor device, are required to be such that the performance of the device is not adversely affected thereby, these materials either comprising passivating materials for the semiconductor device, or do not affect adversely passivating material provided on the semiconductor body of the device.

- 80 At least one of the plastics sheets may be compliant with at least the portions of the interconnection members with which the sheet is contiguous by the sheet being flexible.

- 85 An adhesive may be provided on at least one of the opposing major surfaces of the two plastics sheets to be secured together. For convenience, and where appropriate, in this specification and the accompanying claims such adhesive is considered to be part of the plastics sheet. With such an arrangement it is possible that the adhesive conforms at least to the shape of the portions of the interconnection members with which the adhesive is contiguous, to render, at least partially, the associated plastics sheet or sheets compliant as referred to above. Hence, the associated plastics sheet or sheets, other than the adhesive, could be either flexible or rigid. The adhesive may not cover the whole of said at least one of the opposing major surfaces of the two plastics sheets on which the adhesive is provided.

- 100 A cover may be provided for the device, the cover being secured within the package to be contiguous with the major surface remote from the semiconductor device of a plastics sheet. The cover may be secured to the associated plastics sheet by an adhesive.

- 105 A backing plate for said at least one semiconductor device may be provided, the backing plate being secured within the package to be contiguous with the major surface remote from the semiconductor device of a plastics sheet. The backing plate may be secured to the associated plastics sheet by an adhesive.

- 110 When both a backing plate and a cover are provided for the device, an at least substantial hermetic seal may be provided therebetween, possibly by providing a sealing member to secure the backing plate and the cover together. Thus, the backing plate and the cover may be clamped to the encapsulated device within the package, instead of adhering thereto.

- 120 Conveniently, said at least one semiconductor device comprises a photovoltaic cell, such as a solar cell, and especially a terrestrial solar cell, radiation to which the device is responsive to be incident on the major surface remote from the cell of one of the two plastics sheets.

- 125 It is required that the opposing portion of the plastics sheet is contiguous with the surface of the

cell on which the appropriate radiation is to be incident, to reduce the amount of reflection of the incident radiation before it is received by the cell. Hence, at least the plastics sheet, contiguous with

5 the surface of the cell on which the appropriate radiation is to be incident, may be required to be at least substantially compliant with the shape of the semiconductor device. A cover of a material transport to the radiation to which the cell is  
10 responsive may be provided on the major surface of the two plastics sheets otherwise to be exposed to the radiation. The plastics sheet contiguous with the surface of the cell on which the appropriate radiation is to be incident, and any  
15 adhesive either comprising part of the plastics sheet, or on the otherwise exposed major surface of the plastics sheet, are required to be of materials transparent to the radiation to which the cell is responsive. Usually these materials, and  
20 that of the cover, are required to be stable in ultra-violet radiation.

An array of semiconductor devices may be encapsulated between the two plastics sheets, the array being interconnected in the required manner  
25 by the associated interconnection members.

At least parts of the associated interconnection members may be provided initially on at least one of the two plastic sheets, before the semiconductor device is fed between the  
30 sheets.

The two plastics sheets provided may be of different materials.

The two plastics sheets may be provided by two initially continuous webs, the webs being  
35 severed into the required two sheets, possibly after the encapsulation of the semiconductor device therebetween.

According to another aspect the present invention comprises a package in which are  
40 encapsulated at least one semiconductor device and parts of associated interconnection members between two plastics sheets.

The present invention will now be described by way of example with reference to the  
45 accompanying drawings, in which:

Figure 1 is a perspective view of apparatus comprising a laminating machine, associated feeding means and severing means, the apparatus encapsulating semiconductor devices  
50 by employing a method in accordance with one embodiment of the present invention, and

Figure 2 is a section of a package, comprising an encapsulated array of terrestrial solar cells, produced by the apparatus shown in Figure 1.

55 As illustrated, an assembled array 10 of semiconductor terrestrial solar cells 11 is positioned on an endless rubber belt 12. The belt 12 is provided with locating studs 13 by which the cells 11 can be held temporarily in their required relative positions. The cells 11 are interconnected in the required manner to complete the array 10 by securing thereto, for example, by soldering or welding, preformed members 14 comprising  
60 electrical interconnections for the cells, and not  
65 considered to be parts of the cells. The preformed

members 14 also include terminals for the array 10, to be connected to external connections to the array. For convenience the interconnection members 14 are not shown in Figure 2. The array 10 on the rubber belt 12 extends in a substantially horizontal plane.

The endless rubber belt 12 is movable over rollers 15, and is mounted on a carriage (not shown). The carriage, with the belt, is displaceable  
75 in directions, indicated by arrows 16, transverse to the longitudinal axis of the belt, into and out of a loading position for a laminating machine 17. In relation to the laminating machine 17, the belt 12, the rollers 15 and the carriage comprise  
80 associated feeding means. When in the loading position for the laminating machine the assembled array 10 of cells is fed, in a substantially horizontal plane, from the belt 12, by rotating the rollers 15, and onto a table 18 of the machine. Thus, the  
85 array is fed into the laminating machine without any stress or distortion occurring within the array.

In the laminating machine 17 two initially-continuous webs of a suitable plastics material cover the array 10 of cells as the array is fed  
90 through the machine. One plastics web 20 is supplied from a roll 21 above the array 10 via an idler 22. As shown in Figure 2, the major surface of this web 20 to be adjacent to the array is coated with a suitable heat-activated adhesive  
95 23, the adhesive being considered to be part of the web. The other plastics web 24 is supplied from a roll 25 below the array 10 via an idler 26. As also is shown in Figure 2, both major surfaces of this other web 24 are coated with a suitable heat-activated adhesive, one adhesive coating 27, to be  
100 considered to be part of the web, and to be adjacent to the array, and the other adhesive coating 28 to be remote from the array. The major surface of the plastics web 24 to be remote from the array, as shown in Figure 1, is initially covered with a web 29 of a readily releasable backing paper.

Before reaching the array 10 the major surfaces of the plastics webs 20 and 24 to be remote from the  
110 array are heated by passing over heated shoes 30, so that when the webs 20 and 24 reach the array contiguous parts of the opposing major surfaces of the webs are capable of adhering together, under pressure, to form a substantial hermetic seal.

115 The webs 20 and 24 reach the array at a pair of co-operating laminating rollers, comprising an upper roller 31 and a lower roller 32. The laminating rollers 31 and 32, which are of a flexible material, are arranged to provide sufficient pressure to cause the contiguous parts of the opposing major surfaces of the webs 20 and 24 to adhere together, without causing any damage or permanent distortion to the array 10. The two plastics webs 20 and 24 and the array 10 of cells  
120 are fed together through the laminating rollers 31 and 32, with the array sandwiched between the webs. The array is substantially hermetically sealed between the plastics webs 20 and 24 by the contiguous parts of the opposing major surfaces of the webs adhering together, and by other parts of  
130

the opposing major surfaces of the plastics webs which are continuous with the array adhering to the array.

5 The plastics webs 20 and 24 and the array 10 of cells are fed through the laminating machine 17 by a co-operating pair of pull rollers 33 located where the plastics webs, with the array sealed therebetween, leave the machine. The passage of the webs and the array through the laminating machine is in a substantially horizontal plane.

10 At the lower laminating roller 32, the backing paper web 29 is pulled away from the major surface of the lower web 24 remote from the array, and the backing paper web 29 is wound up on take-up roller 34.

15 Between the laminating rollers 31 and 32 and the pull rollers 33 an aluminium backing plate 35 is secured to the lower plastics web 24, and beneath the array 10.

20 The backing plate 35 is secured to the lower web 24 by the adhesive coating 28 on the major surface of the web remote from the array. The backing plate is secured to the plastics web 24 as the array, sealed between the plastics webs 20 and 24, passes through a second co-operating pair of laminating rollers, also of flexible material. The location of the upper laminating roller 36 of the second pair is fixed. The lower laminating roller 37 of the second pair is rotatably mounted on a carriage 38. The carriage 38 is displaceable in directions, indicated by arrows 39, transverse to the longitudinal axis of the direction of movement of the plastics webs between the two pairs of laminating rollers 31 and 32, and 36 and 37, and into and out of an operable position beneath the webs. When the carriage 38 is remote from the operable position a backing plate 35 is placed on the carriage, with the end of the plate remote from the first pair of laminating rollers 31 and 32 resting on the lower laminating roller 37 of the second pair. The plate is heated by means within the carriage. The carriage is then moved into the operable position, and the laminating roller mounted thereon is raised, by indexing means (not shown), to co-operate with the other laminating roller 36 of the second pair. Thus, sufficient pressure is applied to the backing plate 35 and to the plastics webs 20 and 24, with the array 10 sealed therebetween, to cause the plate to be secured to the lower web 24 by the adhesive coating 28.

50 A pair of cooling fans are provided between the second laminating rollers 36 and 37 and the pull rollers 33, one fan (not shown) being above the plastics webs, and the other 40 being below the plastics webs.

55 Beyond the pull rollers 33, severing means 41 associated with the laminating machine 17 cuts the plastics webs 20 and 24, with an array 10 of cells individually encapsulated between web portions, or sheets, in each severed piece. Thus, each severed piece comprises a package 42 of an encapsulated array 10, as shown in Figure 2.

60 The laminating machine 17, the associated rubber belt 12 and severing means 41, are

provided with required drive means, indexing means and control means, all not shown, so that the rollers 15 for the rubber belt 12, at least the raising mechanism for the lower laminating roller 37 of the second pair, the pull rollers 33, the take-up roller 34 for the backing paper web 29, the carriage (not shown) for the rubber belt 12, the carriage 38 for the lower laminating roller 37 of the second pair, and the severing means 41 all are operated in the appropriate sequence to encapsulate, and to separate from the webs in their initially-continuous form, the array 10. The supply rolls 21 and 25, and/or at least one of the first laminating rollers 31 and 32, and/or at least one of the second laminating rollers 36 and 37 also may be provided with associated drive means and control means, the remaining such rolls and rollers all comprising idlers without such drive and control means. The arrangement is such that 85 arrays 10 of cells are encapsulated between the initially-continuous plastics webs, within the laminating machine, with a conveniently provided spacing therebetween, as indicated by two adjacent arrays 10' shown in broken line form in Figure 1. The movement of the plastics webs through the laminating machine conveniently, but not essentially, is at a constant speed.

90 The flexible laminating rollers 31 and 32, and 36 and 37, are mounted so that the pressure which they apply, and/or their pinch separation, may be adjusted.

95 The laminating machine 17 and the associated rubber belts 12, described and illustrated, are adapted to encapsulate arrays 10 of cells in a continuous manner. Whilst one array is being fed through the machine another array is being positioned on a rubber belt 12. It is convenient to provide two rubber belts side by side. Hence, whilst one rubber belt is in the common loading position for the machine, with the rollers 15 associated with the belt rotating, to feed an array into the machine, the other rubber belt is not in the loading position. The other rubber belt, with its rollers 15 stationary, is capable of having an array positioned thereon. The two rubber belts provided are moved simultaneously, respectively, into and out of the common loading position, and when not in the loading position are on opposite sides of the loading position. In Figure 1 two rubber belts 12 are illustrated, but, if only one belt is provided it may be assumed that this belt is shown in both its loading position and in its location remote from the loading position.

100 Similarly, two lower laminating rollers 37 of the second pair conveniently are provided on the displaceable carriage 38, the arrangement being such that one lower laminating roller (not shown) is raised in the common operable position, whilst the other lower laminating roller, as illustrated, is lowered in its inoperable position. In Figure 1 a part of the carriage 38 is shown, in continuous line form, in the inoperable position for an illustrated, lower laminating roller 37. The positions of the carriage 38 corresponding to the common operable position, and the inoperable position of 130

the other, unillustrated, lower laminating roller 37, are indicated in broken line form. The two lower laminating rollers are moved simultaneously, respectively, into and out of, the common operable position, and when in their inoperable positions are on opposite sides of the operable position. Thus, a backing plate 35 may be placed on one of the lower laminating rollers when in its inoperable position; whilst the other lower laminating roller is in its operable position, and another backing plate is being bonded to the lower plastics web 24.

Hence, the apparatus, comprising the laminating machine, the associated feeding means and severing means, is fast in operation and encapsulates the arrays 10 in an inexpensive manner.

Means (not shown), and provided within the laminating machine adjacent to the first pair of laminating rollers 31 and 32, ensures that each array 10 is encapsulated between the plastics webs 20 and 24 in an inert atmosphere, or an atmosphere of substantially zero pressure is provided between the webs. If an atmosphere of substantially zero pressure is provided it may not be necessary for the first pair of laminating rollers to apply a significant pressure in order to bond the contiguous parts of the plastics webs 20 and 24 together.

Each array 10 of cells 11 may be assembled on a rubber belt 12, when the belt is not in the loading position for the laminating machine, and from the constituent parts of the array, or a preformed array may be transported on to the belt when the belt is not in the loading position. In order to reduce the amount of reflection of the incident radiation before it is received by the cell, it is required that the web 20 is contiguous with the surface of the cell upon which the radiation is to be incident. For the illustrated package 42 it is required that radiation to which the cells 11 are responsive is transmitted by both the portion of the plastics web 20, and the adhesive coating 23 for this web portion, the radiation to be incident on the web portion 20. Thus, at least the plastics web 20 and the adhesive coating 23 therefore are to be transparent to the radiation. further, each part of the package which may be subjected to ultraviolet radiation must be of a material stable in ultra-violet radiation. Hence, the portion of the plastics web 20 including the adhesive coating 23, at least, must be so stable. Plastics polymers so stable and suitable to form a web, for example, may include fluorine, such as fluorinated polyethylene or polypropylene, or polyvaniladene fluoride, or may comprise a polycarbonate or polymethylmethacrylate. Suitable heat-activated adhesives so stable include fluorocarbons of low Molecular Weight, or partially cured silicone rubber. Plastics polymers not so stable, but suitable to form a web, and which may be employed at least as the web portion 24 of the semiconductor package 42, include the polyesters, the polyamides and polyvinylchloride. A heat-activated adhesive not so stable is

polyvinylchloride, which may be employed as the adhesive coating 27 or 28 for the web 24. Because the cells are not coated with a potting compound, it is essential that the materials of the plastics webs 20 and 24, including the adhesive coatings 23 and 27 to secure the plastics webs together and to the array, should be such that they do not affect adversely the performances of the semiconductor devices. thus, they should comprise suitable passivating materials for the semiconductor devices, or at least not affect adversely the passivating material provided on the semiconductor bodies of the devices.

In the illustrated arrangement, it is essential that the plastics webs 20 and 24 are of flexible material, and in the package 42 conform closely to the shape of the constituent parts of the encapsulated array, and especially to the portions of the interconnection members, with which they are contiguous, and in sealing engagement.

In one particular embodiment the cells are 0.01 inch thick, and the plastics webs are each 0.005 inch thick. Conveniently, each plastics web has a thickness, in the range 0.002 to 0.01 inch. the adhesive coatings 23 and 27 to be secured together each is required to have a thickness of the remainder of the plastics web on which it is provided. Each plastics web 20 or 24 may have a width of approximately 2 feet.

The aluminium backing plate 35 may be anodised before being supplied to the laminating machine.

Instead of the major surface of the plastics web 24 to be remote from the array being coated with the adhesive 28, the adhesive required to bond a backing plate 35 to the web is provided on the backing plate. Hence, the need to provide the readily-releasable backing paperweb 29 for the plastics web 24 is obviated.

An aluminium backing plate may not be provided for each encapsulated array of cells. Thus, the second pair of laminating rollers 36 and 37, and the associated carriage 38, are omitted from the apparatus described above when a package without a backing plate is required.

A stiff transparent upper cover (not shown), may be provided for the semiconductor package 42, to protect the surface of the encapsulated array 10 of cells to be exposed to incident radiation.

Suitable materials for such a cover include glass and "perspex" (Registered Trade Mark). Such a cover may be bonded to the otherwise exposed major surface of the plastics web 20 at the second pair of laminating rollers 36 and 37, and simultaneously with the bonding of the aluminium backing plate 35 to the plastics web 24. The cover may be held temporarily on a vacuum chuck, and released therefrom to be deposited on the plastics web 20 over an array 10, simultaneously with the raising of the lower laminating roller 37 to co-operate with the upper laminating roller 36. The cover may be bonded to the plastics web 20 by an adhesive coating on the major surface of the web to be remote from the array 10, this major surface of the plastics web

being provided with a readily-releasable backing paper web. Such a backing paper web is pulled from the plastics web 20 at the upper laminating roller 31 of the first pair, and is wound up on a take-up roller, in the same manner as that described and illustrated for the backing paper web 29 on the plastics web 24. Alternatively, the cover may be coated with adhesive before being deposited on the plastics web 20, obviating the need to provide the backing paper web for the plastics web 20. The adhesive provided between the cover and the plastics web 20 may be heated in any convenient manner before the cover is deposited on the plastics web.

Cavities may be present between the encapsulated array 42 and the backing plate and/or the cover if adhesive does not fill in the whole of the space between the encapsulated array and the backing plate and/or the cover, but, apart from possibly causing reflection of the incident radiation such cavities are not disadvantageous.

The construction of the semiconductor package produced by the apparatus including the laminating machine may be modified. Thus, it may not be necessary for the plastics webs to include adhesive, for example, if the webs are each of a suitable thermoplastics material, the webs may be secured directly together and/or to the backing plate and/or to the cover. The webs may not be secured to the array, but the webs are required to be in sealing engagement with the interconnection members. In addition, or alternatively, it may not be necessary either to heat or to apply pressure to the plastics webs, or the backing plate, or the cover, if suitable adhesive materials and/or plastics materials for the webs are employed. It may be possible to coat with adhesive only one of the two opposing major surfaces of the plastics webs to be secured together by the adhesive. The adhesive may not cover the whole of a web surface or surfaces. If each plastics web is provided with an adhesive coating to be secured together, these two adhesive coatings may be of different materials. The adhesive or adhesives provided to bond the backing plate and/or the cover to the major surfaces of the plastics webs to be remote from the array of cells may be different from each adhesive to secure the plastics webs together. If adhesive is provided on both major surfaces of a plastics web it may not be necessary to provide a backing paper web for the plastics web. The two webs may be of different materials.

The arrangement of the package comprising the encapsulated array, conveniently, is such that the terminals for external connections to the array are exposed. Thus, the terminals, provided by electrical interconnecting members of the array, may extend beyond at least one longitudinal edge of at least one of the initially continuous plastics webs. One of the two provided plastics webs may have a smaller width than the other, so that the terminals of the encapsulated array extend beyond the smaller width web, but adhere to, and are supported by, the larger width web. Alternatively,

contact may be made with interconnection members, which are initially wholly encapsulated, by punching through at least one of the webs.

The webs may not conform to the shape of the semiconductor devices.

Desirably the array is at least substantially hermetically sealed within the package. A commercially acceptable lifetime for a semiconductor device, which is either hermetically sealed, or not hermetically sealed, can be provided with a method of packaging according to the present invention.

Instead of providing materials for the webs, including the adhesive between the webs, which either are passivating materials, or do not adversely affect passivating materials, the semiconductor devices may be coated with a potting compound.

When adhesive is provided for at least one of the webs, the arrangement may be such that the adhesive conforms to the shape of the parts of the array with which it is contiguous, rendering at least partially the web compliant as required for the method according to the present invention. Hence, the associated plastics sheet or sheets, other than the adhesive, could be either flexible or rigid.

When both a backing plate and a cover are provided for the array, an at least substantial hermetic seal may be provided therebetween. In one such arrangement a sealing member, of a suitable plastics material secures the backing plate and the cover together to provide the at least substantial hermetic seal. In any such arrangement the backing plate and the cover may be clamped to the encapsulated device within the package, instead of adhering thereto.

At least parts of the associated interconnection members may be provided initially on at least one of the two plastics webs, before the array is fed between the webs. The packages described above have advantageous constructions, and are cheap, being produced from inexpensive materials.

The terrestrial solar cells 11 of an array 10 are manufactured in a conventional manner.

Any form of semiconductor device may be encapsulated by the apparatus described above, and including a laminating machine. The semiconductor devices so encapsulated may not be part of an array, but may be packaged individually between the plastics webs.

The packaged semiconductor devices may not be severed from the initially-continuous plastics webs adjacent to the laminating machine, but instead the webs direct from the laminating machine may be wound upon reels and transported in this manner. Subsequently, the semiconductor devices may be severed from the initially-continuous webs whilst remaining sealed within the plastics material.

Instead of encapsulating the semiconductor devices between initially continuous plastics webs, sheets of plastics material may be employed, the semiconductor devices being fed between pairs of such sheets to be encapsulated thereby.



# CLAIMS

1. A method of encapsulating at least one semiconductor device, and parts of associated interconnection members connected to the semiconductor device, in a package, comprising providing two compliant plastics sheets, feeding the semiconductor device between opposing major surfaces of the plastics sheets, and securing together in a sealing relationship at least contiguous parts of the opposing major surfaces of the plastics sheets, to encapsulate the semiconductor device, the plastics sheets being compliant with at least the shape of the portions of the interconnection members with which the sheets are contiguous, the plastics sheets being in sealing engagement with the contiguous portions of the interconnection members.

2. A method as claimed in claim 1 in which at least some of the parts of the two plastics sheets contiguous with the semiconductor device and/or with the associated interconnection members are secured thereto.

3. A method as claimed in claim 1 or claim 2 in which the device is encapsulated by the application of heat to the plastics sheets.

4. A method as claimed in claim 1 or claim 2 or claim 3 in which the device is encapsulated by the application of pressure to the plastics sheets.

5. A method as claimed in claim 4 in which the required pressure on the two plastics sheets is provided, at least partially, by encapsulating the device in an atmosphere of substantially zero pressure between the two plastics sheets.

6. A method as claimed in any one of claims 1 to 4 in which the device is encapsulated between the two plastics sheets in an inert atmosphere.

7. A method as claimed in any one of the preceding claims in which the device is coated with a potting compound, before being fed between the two plastics sheets.

8. A method as claimed in any one of the preceding claims including providing at least one of the plastics sheets compliant with at least the portions of the interconnection members with which the sheet is contiguous by the sheet being flexible.

9. A method as claimed in any one of the preceding claims in which an adhesive is provided on at least one of the opposing major surfaces of the two plastics sheets to be secured together.

10. A method as claimed in claim 9 including the adhesive conforming at least to the shape of the portions of the interconnection members with which the adhesive is contiguous, to render, at least partially, the associated plastics sheet or sheets compliant.

11. A method as claimed in claim 9 or claim 10 including providing the adhesive not to cover the

whole of said at least one of the opposing major surfaces of the two plastics sheets, on which the adhesive is provided.

12. A method as claimed in any one of the preceding claims in which a cover is provided for the device, the cover being secured within the package to be contiguous with the major surface remote from the device of a plastics sheet.

13. A method as claimed in any one of the preceding claims in which a backing plate is provided for the device, the backing plate being secured within the package to be contiguous with the major surface remote from the device of a plastics sheet.

14. A method as claimed in claim 13 when dependent on claim 12, and including providing an at least substantial hermetic seal between the backing plate and the cover.

15. A method as claimed in claim 14 in which the at least substantial hermetic seal is obtained by providing a sealing member to secure the backing plate and the cover together.

16. A method as claimed in claim 14 or claim 15 in which the backing plate and the cover are clamped to the encapsulated device within the package.

17. A method as claimed in any one of the preceding claims including providing a semiconductor device comprising a photovoltaic cell, the opposing portion of the plastics sheet being contiguous with the surface of the cell on which the appropriate radiation is to be incident.

18. A method as claimed in claim 17 including providing any part of the package, on the surface of the cell on which the appropriate radiation is to be incident, stable in ultra-violet radiation.

19. A method as claimed in any one of the preceding claims in which an array of semiconductor devices are encapsulated between the two plastics sheets, the array being interconnected in the required manner by the associated interconnection members.

20. A method as claimed in any one of the preceding claims in which at least parts of the associated interconnection members are provided initially on at least one of the two plastics sheets.

21. A method as claimed in any one of the preceding claims in which are provided two plastics sheets are of different materials.

22. A method as claimed in any one of the preceding claims in which the two plastics sheets are provided by two initially continuous webs, the webs being severed into the required two sheets.

23. A package in which are encapsulated at least one semiconductor device, and parts of associated interconnection members, between two plastics sheets, and by a method as claimed in any one of the preceding claims.

24. A method of encapsulating at least one semiconductor device substantially as described herein with reference to the accompanying drawings.

5 25. A package with at least one semiconductor device encapsulated between two flexible plastics sheets substantially as described herein with reference to the accompanying drawings.

---

Printed for Her Majesty's Stationery Office by the Courier Press, Leamington Spa, 1980. Published by the Patent Office,  
25 Southampton Buildings, London, WC2A 1AY, from which copies may be obtained.